# SPECTROSCOPIA MOLECULAR

UN PERIODICO DE NOVAS E INFORMATIONES DE INTERESSE E VALOR AL SPECTROSCOPISTAS

Publicate in interlingua per Forrest F. Cleveland, Professor de Physica, Instituto Technologic de Illinois, Chicago 16. Consiliero linguistic, Dr. A. Gode, Division de Interlingua, Science Service, 80 East 11th St., New York 3. 12 numeros per anno, $2.25. Le periodico depende de receptas financiari ab illes qui beneficia de illo.

Volumine 7 | Junio 1958 | Numero 74

## COLLOQUIO SUPER LE SPECTROSCOPIA RAMAN ES TENITE IN STUTTGART

UN COLLOQUIO super le spectroscopia Raman esseva tenite le 13 e 14 de martio al Laboratorio del Chimia Inorganic del Technischen Hochschule a Stuttgart in Germania.

Discursos presentate esseva:

• Description de un spectrometro, de un lampa, e de un instrumento photoelectric que face possibile le registration e observation rapide del spectros Raman per uso de un oscilloscopio cathodic. M. M. DELHAYE, Lille.

• Plure disveloppamentos instrumental que meliora e extende le analyse Raman. G. MATZ, BASF Ludwigshafen.

• Investigationes con le apparatos Raman del Firma Hilger, specialmente del excitation del spectros con le linea verde de Hg-c. F. FEHÉR, Köln.

• Un amplificator de registration con un plus parve largessa de banda. L. BECKMANN e R. MECKE, Freiburg im Breisgau.

• Un arrangiamento pro le registration del radiation Raman polarisate con le spectrometro Raman del Firma Hilger. A. SCHÜHLY e R. MECKE, Freiburg im Breisgau.

• Mesuration del intensitates del lineas Raman e Rayleigh. H. SCHRÖTTER, Bamberg.

• Possibilitates de errores in le analyse spectroscopic de solutiones. E. LIPPERT, Stuttgart.

• Alicun experimentos con le lampas Toronto. E. PREUSS, Firma C. A. Steinheil, Munich.

• Comparation de un lampa Toronto con un lampa recte de Hg con un reflector elliptic pro le excitation del spectros Raman. A. REULE, Firma C. Zeiss, Oberkochen.

• Un lampa de Hg a basse pression e refrigidate con aqua pro uso in le excitation del spectros Raman. H. MOSER, Munich.

• Alicun experimentos con lampas de Hg a alte pression operate con impulsos electric. G. BERGMANN, Dortmund-Aplerbeck.

• Relationes inter le diffusion Raman, le absorption, e le fluorescen-

### GEMMA DE SAGESSA

PAUCOS DEL conductores del physica ha laborate completemente sol. Normalmente, le physico brillante require assistentia -- le assistentia habile e intelligente de scientistas qui es quasi su pares -- pro extender le ramificationes de su pensatas e pro facer le experimentos suggerite per su ideas.

-- K. K. DARROW.

tia (le effecto Raman de resonantia). J. BEHRINGER, Bamberg.
• Fortias intermolecular in le acidos de acrylo monomeric e polymeric e su derivatos. N. HEINTZ, Dresden.
• Cambiamentos in le spectros Raman causate per le ligage hydrogenic. G. GLATZER, Munich.

Isto comple le lista de discursos presentate le prime die. Illos presentate le secunde die esseva:

• Determination del orientation del ligamines in crystallos per uso del effecto Raman. J. CHAPELLE, Nancy.
• Vibrationes de grilliage in crystallos del acido benzoic. O. SCHIFFERDECKER e W. MAIER, Freiburg im Breisgau.
• Investigationes spectroscopic Raman e infrarubie de $H_2SeO_3$ e su sales acidic. A. SIMON, Dresden.
• Spectros vibrational de metaphosphatos in le stato crystallin. H. STEGER, Dresden.
• Fortia de ligar del fragmentos del oxyacidos in le complexos de cobalt. H. SIEBERT, Clausthal-Zellerfeld.
• Studio del formation de chlorobromuros stannic in mixturas de $SnCl_4$ e $SnBr_4$, e un studio del excambio de atomos de halogeno inter le boro e le stanno. M. L. DELWAULLE, M. M. DELHAYE, e G. SCHILLING, Lille.
• Structura del trichloruros de rhodium e le serie homologe del cyansulfanos. F. FEHÉR e He. WEBER, Köln.
• Assignation del vibrationes normal de naphthalina con le assistentia de calculationes de iteration facite con le machina de calculation electronic PERM de T. H. Munchen. J. BRANDMÜLLER e E. SCHMID, Bamberg.
• Le structura molecular e le intensitates del bandas Raman, G. MICHEL, Liege.
• Determination del intensitates specific relative al frequentias $^1$ del serie $AX_4$, $AX_3Y$, $AX_2Y_2$, $AXY_3$, $AY_4$. M. L. DELWAULLE, M. M. DELHAYE, e G. SCHILLING, Lille.
• Contribution al assignation del linea Raman a 1320 K (K = kayser = unda/cm) in le spectro del aldehydo de salicylo per mesurationes de su intensitate. P. CHIORBOLI, Bologna.
• Intensitates in le derivatos monosubstituite de benzena. J. GOUBEAU, Stuttgart.
• Investigationes spectroscopic Raman del laboratorio chimic inorganic del Universitate Amsterdam. H. GERDING, Amsterdam.
• Investigation per le spectroscopia Raman del ligage in compositos que ha le ligamine P-P. M. BAUDLER, Köln.
• Investigationes del polysiloxanos methylic. H. KRIEGSMANN, Dresden.
• Spectros vibrational e structura de methyl-methoxy- e chloro-methoxysilanos. R. FORNERIS e E. FUNCK, Freiburg.
• Spectros Raman de alcali-fluorphosphatos in le stato fundite. W. BUES e K. BUHLER, Stuttgart.

Le colloquio esseva organisate per Prof. J. Goubeau. Le vespere del prime die esseva reservate pro le theatro, le opera, o le concerto. Le banchetto del colloquio esseva tenite in le vespere del secunde die, e le tertie die (sabbato) il habeva un viage per omnibus a transverso le basse valle del riviera Neckar. ô

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EARLE K. PLYLER del statounitese Bureau National de Standards describe un spectrometro de grilliage pro le obtention de spectros infrarubie de moleculas symmetric al assemblea annue del Academia National de Scientias in Washington, D. C. le 28 al 30 de April. Un resolution de circa 0,03 K (K = kayser = unda/cm) esseva obtenite a transverso le region 2 a 5 $\mu$. Lineas separate per solmente 0,024 K ha essite resolvite a 3,6 $\mu$.

Iste region es mesurate con 2 grilliages de 15,000 e 10,000 lineas/2,54 cm, respectivemente. Cata linea del brancas P e R de $CH_4$, $C_2H_4$, e $C_2H_6$ habeva plure componentes. ô

## COMMISSION JUNCTE PRO SPECTROSCOPIA

IN SEPTEMBRE 1957, le Commission Juncte Pro Spectroscopia esseva reorganisate a causa del decision del Union International de Physica Pur e Applicate de cambiar su representation. In consideration de demandas pro un rotation de membros, e pro dar un plus grande emphase super le spectroscopia molecular, le Assemblea General del UIPPA in Roma designava como representantes pro le nove termino le sequente:

S. Frisch (Leningrad),
P. Jacquinot (Paris),
P.F.A. Klinkenberg (Amsterdam),
R. S. Mulliken (Chicago),
G.B.B.M. Sutherland (Teddington).

In addition, le UIPPA nominava H. H. Nielsen como Consiliero Avisante, subjecte a approbation per voto del CJS le qual ha le responsibilitate secundo le regulas pro le selection de consilieros avisante.

### Representantes del UIA

Altere membros del CJS, qui representa le Union International de Astronomia, es:

B. Edlén (Lund),
G. Herzberg (Ottawa),
W. F. Meggers (Washington),
G. Racah (Jerusalem),
C. M. Sitterly (Washington).

Presente Consilieros Avisante, qui representa nulle Union specific, es F. A. Jenkins (Berkeley) e J. E. Mack (Madison).

### Un Triple Commission Juncte

Le action del UIPPA, mentionate supra, interfereva con le plano pro transformar le CJS in un triple commission juncte del UIPPA, UIA, e UICPA (Union International de Chimia Pur e Applicate). Un tal transformation es le responsabilitate del CIUS (Consilio International de Uniones Scientific). Sed nulle action super le transformation pote esser prendite per iste consilio usque le adoption de nove regulas nunc sub consideration pro le governar de su proceduras. In le interim, es proponite que Drs. Herzberg, Mulliken, e Sutherland deberea servir como representantes del interesses del UICPA -- si le uniones respective e le CIUS consenti a iste arrangiamento.

### Le Assemblea in Moscova

Le sequente assemblea del CJS va esser tenite in Moscova le 12 e 14 de augusto, durante le convention del UIA. Es probabile que un del sessiones essera dedicate a discursos scientific. A iste session, Prof.Frisch revidera le activitates spectroscopic in Europa del Est in le campo del spectroscopia atomic, e un de su collegas -- probabilemente Prof. Terenin -- dara un simile discussion pro le campo del spectroscopia molecular. Altere discursos es invitate.

Le agenda provisional del altere session de affaires es le sequente:

1) Processo verbal del assemblea Columbus.
2) Reporto del subcommittee t (tabulation de functiones e matrices theoric).
3) Reporto del subcommittee m (spectros molecular).
4) Discussion in re le supplementar del previe reportos a, b, c, e d.
5) Nove regulas proponite pro le Commissiones Juncte.
6) Transformation del CJS.
7) Relationes con le Commission del Spectroscopia Molecular del UICPA.
8) Contactos con le Commission 14 del UIA in re standards de longitude de unda, secundo le resolution Columbus.
9) Nove consilieros avisante.

P. F. A. KLINKENBERG

## CURSO SUPER LE SPECTROSCOPIA INFRARUBIE

UN CURSO de duo septimanas in le spectroscopia infrarubie va esser offerite al Instituto Technologic de Massachusetts ab le 4 al 15 de augusto. Technicas infrarubie essera tractate durante le 1me septimana e applicationes infrarubie essera discutite in le 2nde septimana.

Richard C. Lord, Prof. de Chimia e Director del Laboratorio de Spectroscopia a I.T.M., conducera le curso, con le assistentia de Prof. E. R. Lippincott del Universitate Maryland.

Expertos visitante qui presentara materias ex lor campos special includera Dr. H. W. Thompson del Universitate Oxford, e Dr. L. J. Bellamy del Ministerio Britannic de Provisiones.

Le companias instrumental ha promittite modellos recente de lor instrumentos infrarubie pro demonstration e uso durante le curso.

Pro plus informationes, scribe a J. M. Austin, Instituto Technologic de Massachusetts, Cambridge 39, Mass. ô

## INSTITUTO INFRARUBIE FISK

LE UNIVERSITATE FISK va tener su 9ne Instituto Annue de Spectroscopia Infrarubie a Nashville in Tennessee ab le 25 al 29 de augusto.

Le objectivo del Instituto es introducer chimistas, biologistas, physicos, e ingenieros al spectroscopia infrarubie e a su usos in le recerca academic e industrial.

Le facultate del Instituto includera:

- N. B. COLTHUP, Compania American Cyanamid;
- EDWARD COVINGTON, E. I. Du Pont De Nemours e Compania;
- NELSON FUSON, Universitate Fisk;
- GLENN GENTRY, Universitate Mississippi, Schola de Medicina;
- ERNEST A. JONES, Universitate Vanderbilt;
- WILBUR I. KAYE, Compania Beckman Instruments;
- JAMES R. LAWSON, Universitate Fisk;
- WILLIAM B. MASON, Universitate Rochester, Schola de Medicina;
- HENRY W. MORGAN, Laboratorio National Oak Ridge; e
- VAN ZANDT WILLIAMS, Corporation Perkin-Elmer.

Sessiones de matino essera dedicate a discursos introductori, illos de postmeridie a labor laboratorial, e illos de vespere a discursos super themas de un natura specialisate.

Facilitates laboratorial includera un varietate de spectrometros a singule e duple fasce de designo recente, insimul con le plus recente accessorios pro specimenes.

In addition a un introduction al methodos e le scopo del spectroscopia infrarubie, le participantes habera un opportunitate ample pro discuter problemas de lor proprie interesse particular con le facultate del Instituto.

Pro informationes additional tanto como formularios de application, scribe a Nelson Fuson, Instituto de Spectroscopia Infrarubie, Universitate Fisk, Nashville 8, Tenn., S.U.A. ô

## CONSTANTES DE DISTORTION ROTATIONAL

IN "UN NOTA super le calculation del constantes de distortion rotational de moleculas $ZX_3Y$ que es axialmente symmetric," J. M. Dowling, R. Gold, e A. G. Meister extende le discussion de un previe articulo in le J. Molecular Spectroscopy 1 (1957) 265-269 pro includer moleculas pro le quales le angulos interligaminic non es tetrahedral. Exemplares de iste nota es disponibile ab le Laboratorio de Spectroscopia, Departimento de Physica, Instituto Technologic de Illinois, Chicago 16, Illinois, S.U. A.

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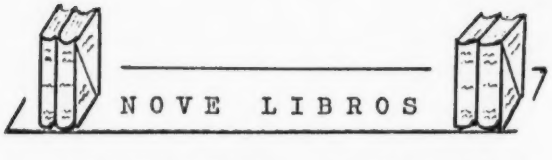
HA VOS pagate vostre $2.00 pro 1958?




• Molecular Electronic Bibliography (Bibliographia Molecular Electronic). Vol. I. Le mechanica quantic molecular e le spectroscopia electronic molecular. Laboratores de tempores passate. LILLI KASHA e MICHAEL KASHA. Publishers Press, Casa Postal 549, Tallahassee, Florida, S.U.A.; 1958. Ps. 136. $3.50; extra le S. U. A., $4.50.

ISTE BIBLIOGRAPHIA consiste de omne le articulos de recerca de 17 investigatores que ha apparite in Chemical Abstracts usque al fin del anno 1955. Un total de 1540 articulos es listate chronologicamente per autor, le referentia al Chemical Abstracts, le titulo, e le referentia al jornal in le qual le articulo esseva originalmente publicate.

Le autores includite es Coulson, Eyring, Heitler, Herzberg, Huckel, Hund, Hylleraas, Jordan, Lennard-Jones, London, Mulliken, Pauling, Penney, Slater, Sponer, Teller, e Van Vleck. Plure de istos es ancora active in iste campo de recerca.

Duo altere volumines es planate. Vol. II va coperir le mesme themas como Vol. I, sed illo includera le gruppo multo plus grande de investigatores qui comenciava lor publicationes post 1935. Vol. III va coperir principalmente le spectroscopia applicate e le photochimia.

Es expectate que volumines supplementari essera publicate a intervallos de cinque annos.

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• Proceedings of the Sixth International Conference on Spectroscopy (Proceduras del Sexte Conferentia International super le Spectroscopia). Redigite per W. VAN TONGEREN e F. FREESE, con le collaboration de E. H. S. VAN SOMEREN. Le Pressa Pergamon, 122 E. 55th St., New York 22; 4 Fitzroy Square, London W. 1; 24 Rue des Écoles, Paris, V$^{e}$; 1957. Ps. 663. $25.00.

CONTINITE IN ISTE libro es le discursos, o in alicun casos summarios de discursos, presentate al 6te Colloquio International Super le Spectroscopia. Isto esseva tenite in Amsterdam in 1956. Le volumine es publicate como un supplemento al jornal, Spectrochimica Acta.

Il ha 9 capitulos. Le titulos de istos es le sequente:

1) Spectroscopia de flamma, 10 articulos, ps. 7-70.
2) Spectrometria de emission, 8 articulos, ps. 71-110.
3) Emission de arco, 17 articulos, ps. 111-232.
4) Emission de scintillas electric, 15 articulos, ps. 233-309.
5) Emission general, 9 articulos, ps. 310-360.
6) Instrumentation pro spectros emissionic, 19 articulos, ps. 361-478.
7) Instrumentation pro methodos absorptionic, 8 articulos, ps. 479-514.
8) Absorptiometria ultraviolette, 7 articulos, ps. 515-564.
9) Spectroscopia infrarubie, 15 articulos, ps. 565-650.

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• Splitting of Terms in Crystals (Le Finder de Terminos in Crystallos). H. A. BETHE. Consultants Bureau, 227 W. 17th St., New York 11. Ps. 69. $3.00.

TRADUCTION IN ANGLESE de un articulo que appareva in le Annalen der Physik 3 (1929) 133-206. Le influentia de un campo electric de symmetria prescribite (le campo crystallin) super un atomo es tractate per le methodos del mechanica undic.

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• Lectures on Selected Topics in the Theory of Molecular Electronic Structure and Spectra (Conferentias super Themas Seligite in le Theoria del Structura e Spectros Electronic Molecular). ROBERT G. PARR. Departimento de Physica, Universitate Chicago, Chicago 37, Ill., 1957. Ps. 47. $

## CALENDARIO de eventos spectroscopic

• JUNIO 9-11. Symposio annue de spectroscopia, Association American de Spectrographos. Pick-Congress Hotel, Chicago. (H. J. Hettel, Armour Research Foundation, 10 W. 35th St., Chicago 16, Illinois, S.U.A.)

• JUNIO 16-20. Symposio super le spectroscopia molecular. Columbus, O. (H. H. Nielsen, Depto. de Physica, Univ. Ohio State, Columbus 10, Ohio.)

• JUNIO. Curso laboratorial super le spectroscopia infrarubie applicate. Instituto Polytechnic de Brooklyn, Brooklyn, N.Y., S.U.A.

• JUNIO 30-JULIO 8. Colloquio super atomos e moleculas ex le recerca radioelectric. (R. Freymann, Univ. Rennes, Francia; J. G. Powles, Depto. de Physica, Collegio Queen Mary, London E.1, Anglaterra.)

• JULIO 7-11. Colloquio annue del gruppo pro le studio de atomos e moleculas per le recerca radioelectric. (Secretariato, Gruppo Ampere, Instituto de Physica, Univ. Geneva, Bd D' Yvoy, Geneva, Switza.)

• AUGUSTO 4-8. Curso in le technicas del spectroscopia infrarubie, e

• AUGUSTO 11-15. Curso in le applicationes del spectroscopia infrarubie. Cambridge, Mass. (J. M. Austin, Instituto Technologic de Massachusetts, Cambridge 39, Mass., S.U.A.)

• AUGUSTO 13-20. Assemblea general del Union International de Astronomia e assemblea 1 9 5 8 del Commission Juncte de Spectroscopia, Moscova. Vide p. 4. (P. F. A. Klinkenberg, Laboratorio Zeeman, Muidergracht 4, Amsterdam-C, Hollanda.)

• AUGUSTO 18-22. Conferentia Gordon super le spectroscopia infrarubie. Academia Kimball Union, Meriden, New Hampshire. (W. G. Parks, Depto. de Chimia, Univ. Rhode Island, Kingston, R. I., S.U.A. Post le 9 de junio usque a augusto 29, le adresse de Dr. Parks essera Collegio Junior Colby, New London, N. H., S.U.A.)

• AUGUSTO 25-29. Instituto annue de spectroscopia infrarubie, Univ. Fisk, Nashville. (N. Fuson, Depto. de Physica, Univ. Fisk, Nashville 8, Tenn.)

• SEPTEMBRE 8-12. Colloquio international de spectroscopia. Liege, Belgica. (Association de Ingenieros del Univ. Liege, 22 rue Forgeur, Liege, Belgica.)

• SEPTEMBRE 15-17. Symposio Ottawa del Association Canadian de Spectroscopia Applicate. (N. Tomingas, Canadian Copper Refiners, Cassa Postal 338, Place d'Armes, Montreal, Quebec.)

• OCTOBRE. Symposio super le spectroscopia Raman e infrarubie. Univ. Kyoto, Japon. (Y. Morino, Univ. Tokio, Tokio, Japon.)

• OCTOBRE. Symposio super le chimia structural. Univ. Osaka, Japon. (Y. Morino, supra-date adresse.)

• JUNIO 1959. Symposio del gruppo europee del spectroscopia molecular. (R. Mecke, Depto. de Chimia Physic, Univ. Freiburg, Freiburg, Germania.)

## CALIBRATION DE SPECTROMETROS PRISMATIC

LONGITUDES DE UNDA standard pro uso in le calibration de spectrometros prismatic ha essite mesurate per E. K. Plyler, L. R. Blaine, e M. Nowak del statounitese Bureau National de Standards in Washington, D.C.

Includite esseva le bandas de absorption de polystyrena, 1, 2, 4-trichlorobenzena, e toluena. Plure bandas del vitro de didymium esseva mesurate pro le region infrarubie proxime e 27 lineas rotational del banda 3,3 μ de $CH_4$ etiam esseva includite.

Le λ's se extende ab 0,6 a 24 μ, sed le plus grande numero es inter 3 e 6 μ. (J.R.N.B.S. 58 (1957) 195-200.)

## R E C L A M O S

Costo: $0.25 per linea.

MONOGRAPHIAS: Spectros Molecular. I. Regulas De Selection Pro Spectros Vibrational De Moleculas Polyatomic. Forrest F. Cleveland, 1953. 25 ps. $0.75.

Spectros Molecular. II. Tractamentos Del Coordinatas Normal De Moleculas Polyatomic. S. M. Ferigle e A. Weber, 1955. Ps. 30. $1.00.

F. F. Cleveland, Depto. de Physica, Instituto Technologic de Illinois, Chicago 16, Ill., S.U.A.

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LIBROS: Interlingua A Prime Vista, $2.00; Interlingua Grammar, $3.50; Interlingua-English Dictionary, $5.00. Storm Publishers, 80 E. 11th St., New York 3, N. Y., S.U.A.

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PERIODICO: "Science News Letter", Le summario septimanal del scientia currente. 52 numeros per anno, 1 anno, $5.50; 2 annos, $10.00; 3 annos, $14.50. Include cata mense un summario in interlingua del currente disveloppamentos in le scientia. Publicate per Science Service, Inc., 1719 N St., N.W., Washington 6, D.C.

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SUBVENTION POSTDOCTORAL: Io desira un Fellowship Postdoctoral pro recerca in le spectroscopia molecular. D. C. Biswas (D. Sc.), Indian Associati on for the Cultivation of Science, Optics Department, Jadavpur, Calcutta 32, India.

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COMPANIAS - INDIVIDUOS: Desira vos insertar un reclamo simile a illos date supra? Le costo pro illos monstrate esserea $3.00, $1.25, $2.25, e $1.75, respectivemente. Isto es un multo parve costo. Pro plus informationes, scribe a: "Spectroscopia Molecular", Departimento de Physica, Instituto Technologic de Illinois, Chicago 16, Illinois, Statos Unite de America.

Le costo de un reclamo simile a illo in le secunde columna esserea $15.00.

SPECTROSCOPIA MOLECULAR

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Un Periodico Mensual De Novas

E Informationes De Interesse E Valor

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s p e c t r o s c o p i s t a s

m o l e c u l a r

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- Publicate in le lingua international, Interlingua (legibile a prime vista) pro un plus facile lectura per le plus grande numero del spectroscopistas del mundo.

- Contine breve reportos del resultatos de nove recerca, un summario del litteratura currente, reportos de assembleas spectroscopic, revistas de nove libros, un calendario de eventos spectroscopic, detalios in re nove instrumentos, e novas in re spectroscopistas e disveloppamentos recente.

- Essential pro illos qui ha un interesse in le structura de moleculas.

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$2.25 per anno ($2.00 si pagamento accompania le ordine). Face cheques pagabile a "Spectroscopia Molecular".

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CHEMICAL AND ENGINEERING
# NEWS

**Strides in Spectrophotometry**

**Raman spectrophotometer offers high light gathering power, freedom from effects of scattered light.**

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Lion Vies for Intercoastal Nitrogen Outlets . . 4222

Industry veteran Marion B. Folsom takes helm of Health, Education, and Welfare . . . Page 4197

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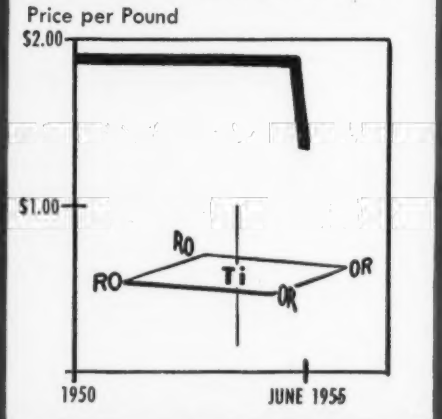


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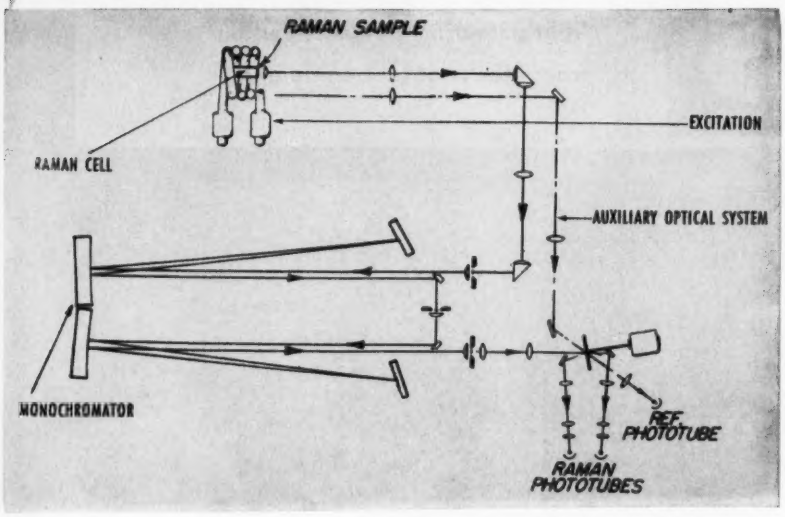
# EQUIPMENT




## Strides in Spectrophotometry

### Raman spectrophotometer offers high light gathering power, freedom from effects of scattered light

In the last few years, great strides have been made in developing spectrophotometers with increased speed and accuracy (C&EN, May 10, 1954, June 28, 1954, and Aug. 2, 1954). These spectrophotometers, for the most part, covered spectral measurements in the infrared to ultraviolet region. Now, manufacturers are extending their improved optical designs to the field of Raman spectroscopy (visible range of the spectrum). And Applied Physics has on the market a Raman spectrophotometer that it believes will satisfy its customers.

Raman spectra are useful in connection with constitutional problems. The change in frequency (Raman effect) takes place within the visible range of the spectrum and is due to the vibration of atoms with definite linkage. It is therefore characteristic of each type of grouping in the molecule and the change in wave length is independent of the wave length of the incident light. Determination of such frequency shifts are valuable in determining formulas for compounds. Consequently, Raman spectroscopy has proved to be a valuable adjunct to infrared in molecular structure studies and the quantitative analysis of complex mixtures.

Applied Physics says it had one main objective in design of its Raman spectrophotometer: to develop an instrument which can be operated in an average industrial or research lab with speed, accuracy, and sample volumes approaching those ordinarily expected from infrared equipment. This objective has been achieved, says Applied Physics, in its Cary Raman spectrophotometer, model 81. According to company, it has taken advantage of improved systems and components which give high light gathering power, freedom from the effects of scattered light, and high zero stability.

Typical performance of the model 81 can be seen in a sample spectra of benzene, according to Applied Physics. The benzene spectrum shows resolution of 10 $cm^{-1}$ and 0.2% accuracy on the height of the principal peak. Company says this is with an 0.1-ml. sample, 10-$cm^{-1}$/second scanning speed, and $^1/_2$-second natural period response. Generally, company says satisfactory spectrograms for most compounds can be obtained with liquid samples of as little as 0.05 ml. and recording times as short as 5 min. for a complete record.

Applied Physics' model 81 features a Shurcliff double slit system for high light gathering power, a Toronto type helical mercury arc excitation source, and a coated optical system for transferring Raman radiation from a sample to a double beam monochromator. Matching photomultiplier tubes act as detectors.

The coated optical system features an image slicer which company says allows for maximum transfer of available radiation at the cell to pass into the monochromator. This image slicer is an arrangement of optical elements which convert the rectangular apertures at the Raman cell into a series of 20 thin slices which are later reassembled end to end so as to match the entrance slit of the monochromator.

According to Applied Physics, an important feature of the optical design is the use of a double monochromator. It not only permits the use of a large slit height to focal length ratio, and the Shurcliff double slit system to gain increased light, but it gives a freedom from the effects of Tyndall and Rayleigh scattering in the sample. In the use of the model 81, Applied Physics says no special filtering or distillation of the sample is required to remove substances giving Tyndall scattering.

According to company, the high zero stability of the model 81 is achieved by a chopped radiation photometric system which is designed to retain stability but avoids the 50% loss of light which normally results from chopping. A rotating semicircular mirror directs radiation alternately to two phototubes, each of which develops an independent Raman signal. These signals are later combined, says company, with a consequent improvement in signal to noise ratio. **E 1**

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For a more complete description of the Cary Raman Spectrophotometer and sample curves, please write for Bulletin MR-1

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# *From analytical research to process stream analysis...*

## Cary Instruments provide greater versatility, accuracy, reliability

**RECORDING SPECTROPHOTOMETERS**
Cary Spectrophotometers are designed for the rapid recording of spectra with good resolving power and high photometric accuracy. In several years of field experience, these instruments have shown the ruggedness and reliability needed for routine laboratory service . . . plus the flexibility to handle a variety of problems in the research laboratory.

**RAMAN SPECTROPHOTOMETER**
The Cary Raman Spectrophotometer uses a unique optical system which offers at least 10 times the light gathering power of previous designs. This and other features provide an instrument that takes full advantage of raman spectroscopy with high speed and accuracy.

**ELECTROMETERS**
Cary Vibrating Reed Electrometers... for measuring very small currents (as little as $10^{-17}$ amperes), charges and voltages . . . provide high sensitivity and accuracy with good stability and reliability. Several models are available for a variety of applications . . . carbon 14 determination, mass spectrometry, pH determinations and many similar applications.

**Versatility** is accomplished through a wider choice of operating ranges, response speeds, sizes and types of samples, sensitivity, a variety of standard and special accessories and custom adaptations for special problems.

**Accuracy** is achieved by the use of advanced design principles which insure the maximum performance permitted by the present state of the art . . . developments which make available sensitivity, stability and reproductibility unattainable with other standard instruments.

**Reliability** is built into Cary Instruments, for example, by using sapphire and carboloy at points of critical wear . . . by employing kinematic principles wherever positions or motions must be precise and reproducible . . . by designing circuits so even large changes in characteristics of vacuum tubes and other components will not affect instrument performance.

*For more comprehensive descriptions, including sample curves, of the complete line of Cary Instruments, write for Bulletin CEN-6*

**INFRARED ANALYZERS**
Cary Infrared Analyzers, for continuous analysis of flowing samples, utilize selective detection and a double beam optical system. They are more free from zero drift and have higher inherent discrimination against interfering sample components than other similar types of analyzers. This provides unusual adaptability to difficult analytical problems requiring high sensitivity and accuracy in complex mixtures.

**ULTRAVIOLET ANALYZERS**
Cary Ultraviolet Analyzers provide a simple, reliable means of continuously analyzing flowing samples for components which absorb UV or visible radiation or which can be converted to a suitable absorbing substance.

Cary
INSTRUMENTS

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